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For: TRACK JUMP APPARATUS AND METHOD WHICH PERFORM TRACK JUMPING CONSIDERING POSITION OF PICKUP

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TITLE OF THE INVENTION

TRACK JUMP APPARATUS AND METHOD WHICH PERFORM TRACK JUMPING CONSIDERING POSITION OF PICKUP

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of PCT International Patent Application No. PCT/KR2004/001696, filed July 9, 2004, and Korean Patent Application No. 2003-48307, filed July 15, 2003, in the Korean Intellectual Property Office, the disclosures of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] Aspects of the present invention relate to an optical disc record/playback apparatus and method, and more particularly, to a track jump apparatus and method which perform track jumping in consideration of a position of a pickup and a position of a lens of the pickup with respect to an optical recording medium in a system with eccentricity.

2. Description of the Related Art

[0003] A track is a field in an optical disc in which data is written, and rotation eccentricity of the optical disc occurs due to eccentricity of the optical disc and/or eccentric chucking of the optical disc. Rotation eccentricity is a phenomenon generated due to discord between a spindle rotation axis of the optical disc and a track center of the optical disc.

[0004] Rotation eccentricity causes instability in a servo system when movement between tracks (hereinafter, track jump) is performed. Thus, a distance that must be moved when the track jump is performed is affected by an offset deviation and a movement deviation due to the rotation eccentricity. Offset deviation and movement deviation cause track sliding and a focus drop.

[0005] FIG. 1A is a block diagram of a conventional servo system for a track jump and FIG. 1B is a block diagram of the optical pickup shown in FIG. 1A..

[0006] Referring to FIGS. 1A and 1B, the servo system includes an optical disc 100, a pickup 101 including a cover 101-1, a lens 101-2, and a coil 101-3, a radio frequency (RF) processing unit 102, which generates several error signals controlling the pickup 101 by shaping and amplifying a signal detected from the pickup 101, a servo 103, which controls the error signals output from the RF processing unit 102, and a driver 104, which drives the pickup 101 by amplifying the control signal output from the servo 103.

[0007] When the servo system of FIG. 1 is tracking the optical disc 100, the RF processing unit 102 outputs an error signal by shaping and amplifying an output signal of the pickup 101. The servo 103 outputs an error compensation signal, which is a control signal, by converting the error signal output from the RF processing unit 102 into a digital signal and filtering the digital signal. The driver 104 amplifies the error compensation signal output from the servo 103 and outputs the amplified error compensation signal to the pickup 101. With the above processes, the servo system maintains tracking.

[0008] If a track jump is performed while tracking the optical disc 100, the servo 103 cuts off the error compensation signal output to the driver 104 and outputs a kick voltage to the driver 104. Then, the servo 103 calculates a track to be jumped and sets an output time of a break voltage. When the pickup 101 arrives at the target track, the servo 103 outputs the break voltage to the driver 104.

[0009] A description of a track jump in a servo system is disclosed in U.S. Pat. No. 6,226, 246.

[0010] For tracking in the conventional servo system, the servo 103 outputs the error compensation signal, which is the control signal, obtained from the RF processing unit 102. However, if the rotation eccentricity is generated in the optical disc 100 and a system driving the optical disc 100, the range of variation of the error signal output from the RF processing unit 102 is large and unstable due to the same cycle component as a cycle of a rotation eccentricity frequency. That is, the lens 101-2 in the pickup 101 sways to the track direction for tracking.

[0011] If the track jump is performed while the lens is swaying due to the rotation eccentricity, the lens 101-2 is bumped into the cover 101-1 protecting the pickup 101 due to the kick voltage for performing the track jump. Also, if the lens 101-2 moves outward in an operation range

where the lens 101-2 can move to the track direction, the lens 101-2 is out of the target track when the track jump is finished, and accordingly, control of the servo system is unstable.

SUMMARY OF THE INVENTION

[0012] An aspect of the present invention provides a track jump apparatus and method which perform a stable search operation when data record/playback in an optical recording medium is performed by performing track jumping in consideration of the position of a pickup and the position of a lens of the pickup in an optical recording medium and system with eccentricity.

[0013] A track jump method which performs track jumping in consideration of a position of a pickup according to an aspect of the present invention can stably perform a search operation by determining a time of the track jump considering a lens position of the pickup in an optical recording medium and system with eccentricity.

[0014] For record/playback operations of an optical disc, a plurality of track jumps are performed. According to an aspect of the present invention, data transmission is normally performed by saving the time required for the retry when a track jump operation fails. In particular, except for physical characteristics such as a distance between tracks, since internal/external eccentricity components of a system do not affect track jumping, system stability increases.

[0015] According to an aspect of the present invention, a track jump apparatus performing track jumping includes: a pickup reading a signal from an optical disc; an RF processing unit outputting an error signal controlling the pickup by shaping and amplifying a signal transmitted from the pickup; a servo judging a position of the pickup from the error signal output from the RF processing unit and outputting a track jump start/end control signal; and a driver, moving the position of the pickup using the track jump start/end control signal output from the servo.

[0016] Where the position of the pickup judged by the error signal output from the RF processing unit is within a reference range, the servo may output a predetermined voltage for the track jump start/end control to the driver.

[0017] Where the position of the pickup judged by the error signal output from the RF processing unit does not fall within the reference range, the servo may cut off the predetermined

voltage for the track jump start/end control output to the driver until the position of the pickup is within the reference range.

[0018] According to an aspect of the present invention, a track jump method includes: outputting an error signal controlling the pickup by shaping and amplifying an optical disc signal transmitted from the pickup; judging a position of the pickup from the error signal when a track jump is performed and outputting a track jump start/end control signal for the pickup; and moving the position of the pickup using the track jump start/end control signal.

[0019] Where the position of the pickup judged by the error signal is within a reference range, a predetermined voltage may be output for the track jump start/end control; and where the position of the pickup judged by the error signal exceeds the reference range, the predetermined voltage for the track jump start/end control may be cut off until the position of the pickup is within the reference range.

[0020] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1A is a block diagram of a conventional servo system for a track jump;

FIG. 1B is a block diagram of the optical pickup shown in FIG. 1A;

FIG. 2 is a block diagram of a track jump apparatus which performs track jumping in consideration of a position of a pickup according to an embodiment of the present invention; and

FIG. 3 is a flowchart of a track jump method which performs track jumping in consideration of a position of a pickup according to an aspect of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0022] Reference will now be made in detail to the present embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like

reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

[0023] FIG. 2 is a block diagram of a track jump apparatus for performing track jumping in consideration of a position of a pickup relative to an optical disc 200 according to an aspect of the present invention. Referring to FIG. 2, the track jump apparatus includes a pickup 201; an RF processing unit 202; a servo 203 including an analog-to-digital converter (ADC) 203-1, a filter 203-2, a digital-to-analog converter (DAC) 203-3 and a controller 203-4; and a driver 204.

[0024] Referring to FIG. 2, the track jump apparatus which performs track jumping in consideration of a position of a pickup will now be described in detail. When the pickup 201 is tracking the optical disc 200, the RF processing unit 202 amplifies an RF signal transmitted from the pickup 201 to a predetermined value and generates an error signal (a focus error (FE) and tracking error (TE) signal) using the amplified RF signal. The FE and TE signals are generated using the RF signal according to a conventional method.

[0025] The error signal generated in the RF processing unit 202 is input to the servo 203. The servo 203 converts the error signal output from the RF processing unit 202 into a digital signal, performs filtering of the digital signal, and outputs an error compensation signal, which is a control signal. In particular, the servo 203 judges a position of the pickup 201 from the error signal output from the RF processing unit 202 when a track jump of the optical disc 200 is performed and outputs a track jump start/end control signal for the pickup 201.

[0026] The ADC 203-1 included in the servo 203 converts the error signal output from the RF processing unit 202 into the digital signal. The filter 203-2 included in the servo 203 performs filtering of the digital error signal output from the ADC 203-1 with a predetermined frequency component in order to control the pickup 201. The DAC 203-3 included in the servo 203 converts the filtered signal output from the filter 203-2 into an analog signal and outputs the analog signal to the driver 204. The controller 203-4 included in the servo 203 controls the operation of the ADC 203-1, the filter 203-2, and the DAC 203-3.

[0027] If the pickup 201 is normally tracking the optical disc 200, the RF processing unit 202 generates an error signal from an output signal of the pickup 201, and the servo 203 performs

A-to-D conversion, filtering, and D-to-A conversion of the generated error signal and outputs an error compensation signal controlling movement of the pickup 201.

[0028] However, if the pickup 201 performs a track jump while tracking a track, the controller 203-4 cuts off the error compensation signal output to the driver 204. Then, the controller 203-4 determines a track position of a lens of the pickup 201 by monitoring the digital error signal output from the ADC 203-1. The controller 203-4 stores a reference range for outputting a kick voltage and a break voltage to the driver 204 in order to move the pickup 201 when a track jump is performed. The controller 203-4 judges whether a current track position of the lens of the pickup 201 is within the reference range.

[0029] If a track position of the lens of the pickup 201 is within the reference range, that is, where the position of the lens of the pickup 201 is around the track center, the controller 203-4 performs a track jump by providing the kick voltage to the driver 204.

[0030] However, if the track position of the lens of the pickup 201 exceeds the reference range, that is, where the position of the lens of the pickup 201 is far from the track center, the controller 203-4 cuts off the kick voltage to the driver 204 and waits. Then, if a current track position of the lens of the pickup 201 is within the reference range, that is, where the position of the lens of the pickup 201 is around the track center, the controller 203-4 performs a track jump by conducting the kick voltage to the driver 204.

[0031] The controller 203-4 calculates a target track to be jumped and sets an output time of the break voltage. When the pickup arrives at the target track, the controller 203-4 conducts the break voltage to the driver 204.

[0032] FIG. 3 is a flowchart of a method of performing track jumping in consideration of a position of a pickup relative to an optical disc according to an aspect of the present invention.

[0033] Referring now to FIG. 3, a method of performing track jumping in consideration of a position of a pickup relative to an optical disc will now be described in detail. When the optical disc 200 is chucked on a tray (not shown) and driven in operation 300, the controller 203-4 judges whether the pickup 201 has performed a track jump in operation 301.

[0034] If the pickup 201 is normally tracking the optical disc 200, the RF processing unit 202 generates an error signal from an output signal of the pickup 201, and the servo 203 performs A-to-D conversion, filtering, and D-to-A conversion of the generated error signal and outputs an error compensation signal controlling movement of the pickup 201.

[0035] In a case where the pickup 201 performs a track jump, the controller 203-4 cuts off a control signal transmitted to the driver 204 in operation 302.

[0036] The controller 203-4 determines a track position of the pickup 201 in operation 303 by monitoring the error signal output from the RF processing unit 202. The RF processing unit 202 amplifies an RF signal transmitted from the pickup 201 to a predetermined value and generates an error signal (a focus error (FE) and tracking error (TE) signal) using the amplified RF signal. The ADC 203-1 converts the error signal output from the RF processing unit 202 into a digital signal and outputs the digital signal to the controller 203-4. The controller 203-4 determines the track position of the pickup 201 by monitoring the digital error signal output from the ADC 203-1.

[0037] The controller 203-4 judges in operation 304 whether the position of the pickup 201 exceeds a reference range. The controller 203-4 stores a range of values for providing a kick voltage and a break voltage to the driver 204 in order to move the pickup 201 when a track jump is performed.

[0038] If a position of the pickup 201 exceeds the reference range, that is, where a position of a lens of the pickup 201 is far from the track center, the controller 203-4 cuts off the kick voltage to the driver 204 and waits in operation 305.

[0039] The controller 203-4 judges whether the track position of the pickup 201 is within the reference range. If a track position of the lens of the pickup 201 is within the reference range in operation 306, that is, in a case where the position of the lens of the pickup 201 is around the track center, the controller 203-4 conducts the kick voltage to the driver 204 in operation 307.

[0040] After the kick voltage has been conducted to the driver, the controller 203-4 calculates a target track to be jumped and determines an output time of the break voltage in operation 308. When the pickup 201 arrives at the target track, the controller 203-4 conducts the break voltage to the driver 204 in operation 309.

[0041] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.